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PATENT SPECIFICATION



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COMPLETE SPECIFICATION

Improvements in a Process for Obtaining Alcohol and/or Yeast by Fermentation of Liquids containing Carbohydrate

We, N. V. INTERNATIONALE SUIKER EN ALCOHOL COMPAGNIE INTERNATIONALE SUGAR AND ALCOHOL COMPANY "ISACO", of Bijstraat 30, Haag, Holland, a Dutch company, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

10 It is known in the fermentation of liquids containing carbohydrates to allow the liquid to circulate and to keep it in continuous motion in order to avoid disturbances due to the reaction products.

15 It is also known to provide supporting surfaces for the fermentation stimulant in the fermentation bath. Finally, for the purpose of directly removing excess yeast from the liquid maintained in circulation, the fermentation baths have already been provided with installed metal sheets, boards, twigs, rods and the like in such a way that the flow in the ascending liquid was checked and the

25 circulating motion limited to the lowermost zone of the vat. According to the present invention the fermentation liquid is allowed to circulate but it is led from the top to the bottom in the fermentation container, and in fact so that it is divided up into thin layers by trickling.

The division of the liquid into thin trickling layers is most simply effected 35 by allowing it to trickle through a tower, from the top to the bottom thereof, which is provided with filling bodies of known kind or fixed or rigid, frequently crossing installed elements. These filling 40 bodies and installed elements not only offer known favourable attachment surfaces for the fermentation organisms, but through them the liquid experiences a continuous change in direction and 45 acquires a large surface, so that the particles are continuously mixed. The trickling surfaces are throughout in contact with gas spaces so that gaseous products of the action can freely escape.

50 The contact of the liquid with gas spaces over extended surfaces at the same time enables gases supplied to be absorbed, such as air for example in the

case of the production of yeast. This gas supply can here be effected with a very small expenditure of power since, contrary to what has heretofore been usual, the resistance of a high and unbroken liquid layer does not have to be overcome.

In consequence of the continuous thorough mixing of the trickling liquid mass the best conditions for the fermentation can be continuously created, the dissolved nutrient substances added even in higher concentrations and as a result operations can be carried out at concentrations which on an average are higher than formerly.

The invention may be carried out with employment of trickle towers such as are known for other purposes. A tower of this kind arranged suitably for carrying out the process of the invention is shown schematically in the accompanying drawing by way of example.

The tower 1 is filled with filling bodies 2. The filling rests in the usual way on a sieve bottom 3 above a bottom chamber 4 in which latter the trickling liquid collects and which is provided with an inlet union 5 for air or gas. Through the outlet union 6 the liquid passes through a pipe 7 into the container 8 with the pipe coil 9 for regulating the 85 temperature.

The liquid is withdrawn from the container 8 by means of a circulating pump 10, which pump returns it through pipe 11 into the tower 1 again. A part of the liquid is led off through the branch pipe 12 for the purpose of separating the fermentation products therefrom, alcohol and/or yeast. The supply of fresh wort is effected at the top end of the tower 95 through the pipe 13. The gases leave the tower in the direction of the arrow 14.

For the fermentation of wood sugar, the usual Raschig rings of porcelain can be used with advantage as filling for the container. These rings exhibit no perceptible clogging even after lengthy periods of operation.

In a tower plant of the kind shown in the drawing it is possible to diminish the 105 time for the fermentation of sugar to

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alcohol down to below seven hours, whilst in the usual methods of fermentation times of 40-70 hours are necessary. In the production of yeast it has been possible to diminish the fermentation time from twelve to about two or three hours.

In the production of yeast the air introduced through the union 5 had a pressure of about 100 mm. of water for a tower height of about 3 m. The liquid flowing from the tower in the container 8 was kept at the usual temperature of 30-32° C.

15 Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

20 1. A method of obtaining alcohol and/or yeast by fermentation of carbohydrate-containing liquids by a circulating process consisting in allowing the fermentation liquid to trickle down a tower, forming part of the circulating system, over filling bodies of known kind or over rigid or fixed frequently crossing installed elements.

2. A method as claimed in claim 1 in which gas or air is supplied to the fermentation liquid trickling down the tower. 30

3. A method as claimed in claim 1 or 2 in which a part of the fermentation liquid is withdrawn from the circuit for the purpose of removing fermentation products therefrom. 35

4. A method as claimed in any one of the preceding claims in which the temperature of the circulating fermentation liquid is regulated in one part of the circuit. 40

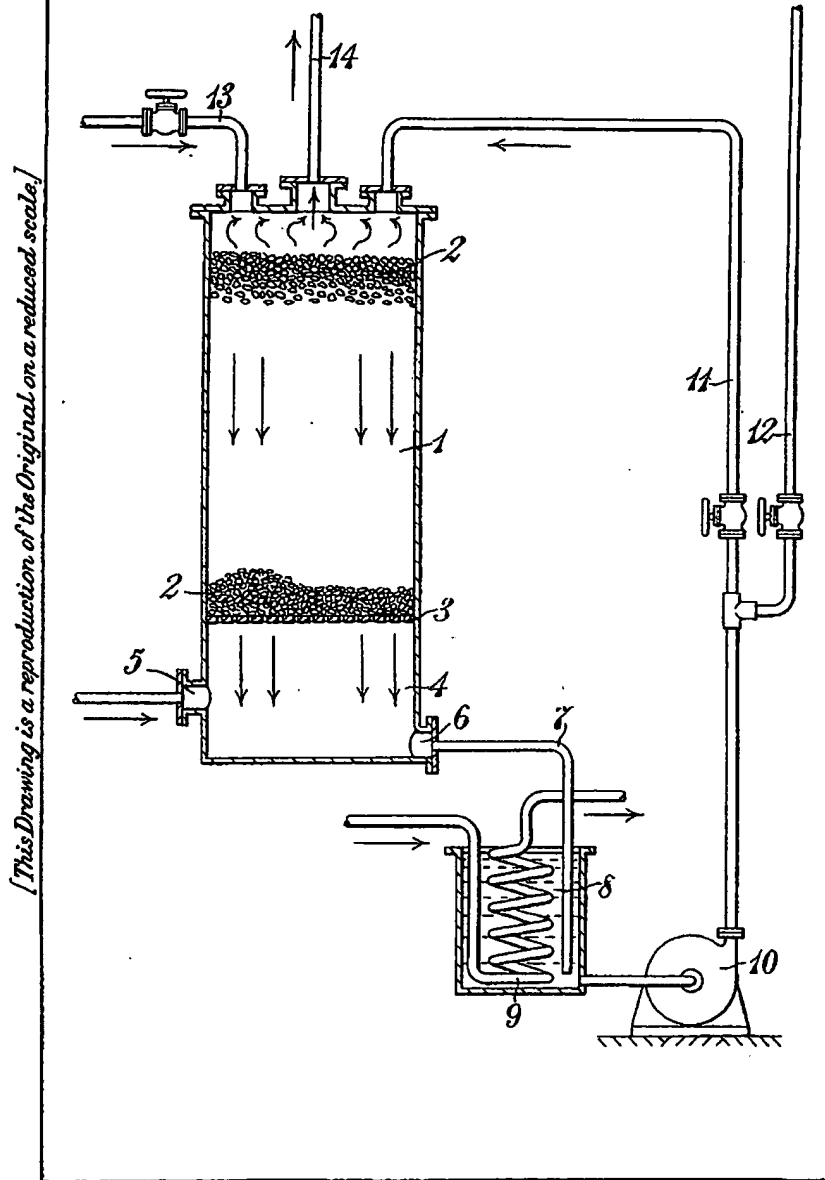
5. A method as claimed in any one of the preceding claims in which the filling bodies consist of Raschig rings. 45

6. The improved method for obtaining alcohol and/or yeast substantially as hereinbefore described.

7. Alcohol and/or yeast when obtained by the method hereinbefore described 50 and claimed.

Dated this 20th day of November, 1936.

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